PATENT ABSTRACTS OF JAPAN

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(71)Applicant : RICOH CO LTD

(72)Inventor : HARIGAI MASATO
KAGEYAMA YOSHIYUKI
DEGUCHI KOJI
YAMADA KATSUYUKI
IWASAKI HIROKO
IDE YUKIO

(54) OPTICAL RECORDING MEDIUM

(57)Abstract:

PURPOSE: To obtain a phase-change optical recording medium having a high reflectance and being excellent in high contrast.

CONSTITUTION: In an optical recording medium having characteristics that an optical constant is changed before and after irradiation with light, an optical recording material having an average coordination number of 2.0-3.0 is used as a recording material. The recording material is represented by a general formula Ax B1-x, where A is one of Zn, Ga, In, Si, Ge, Sn, Bi, Sb, B is one of Se, Te, S, O, and (x) is a composition ratio determined by the range (2.0-3.0) of an average coordination number.

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CLAIMS

[Claim(s)]
[Claim 1] The optical recording medium characterized by the average coordination number of the record ingredient being in the range of 2.0-3.0 in the optical recording medium which has the property that are before and after the exposure of light and an optical constant changes.
[Claim 2] Said record ingredient is the following general formula (I).
AxB1-x (I)
(-- the presentation ratio determined by the range (2.0-3.0) which at least a kind of element and x:average coordination number which were chosen from from among at least a kind of element and B:Se which were chosen from from among A:Zn, and Ga, In, Si, germanium, Sn, Bi and Sb among the formula, and Te, S and O can take -- it comes out --) -- the optical recording medium according to claim 1 which becomes considering the compound expressed as a principal component.
[Claim 3] said record ingredient -- An, Ag, Cn, Cr, Ti, Co, MnTb, Sm, and ** -- the optical recording medium according to claim 1 or 2 characterized by adding at least a kind of element chosen from inside.
[Claim 4] The optical recording medium according to claim 1 to 3 whose amplitude damping coefficient at the time of crystallization of said record ingredient is 0.6 or less.
[Claim 5] The optical recording medium according to claim 1 to 4 which prepared the heat-resistant protective layer which consists of a kind of ingredient chosen from from among an inorganic oxide, inorganic sulfide, inorganic nitrides, or such mixture at least in the top face and inferior surface of tongue of a record layer.
[Claim 6] Claims 1-5 characterized by preparing a metallic reflection heat dissipation layer in the maximum upper layer are the optical recording media of a publication either.

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TECHNICAL FIELD

[Industrial Application] This invention relates to a phase change form optical recording medium.

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PRIOR ART

[Description of the Prior Art] Research of a phase change form optical recording medium activates as optical memory in which record of the information by the exposure of a laser beam, playback, and elimination are possible, and a part has come to be put in practical use. These many are using the ingredient of a germanium-Sb-Te system (JP,62-73438,A, JP,63-228433,A). On the other hand, the research which aimed at the transposition with perfect of a compact disk (CD) is also progressing, and the class of current some is proposed. as the example -- an In-Se system -- a record layer -- carrying out -- SiO2 -- a dielectric layer -- and The thing (collection [of the 4th phase change record study group symposium drafts] P. 82-86) of a configuration of having used Cu for the reflecting layer, Although there is a thing (collection [of the 5th phase change record study group symposium drafts] P. 9-14) of a configuration of having used ZnS-SiO2 for the dielectric layer, and having used Au for the metallic reflective layer etc. using the conventional germanium-Sb-Te system as a record ingredient and all use cross protection The technical problem which has set at the point of a high reflection factor, implementation of high contrast and record sensibility, and an exaggerated light property, and should still be solved is left behind.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to a phase change form optical recording medium.
[0002]
[Description of the Prior Art] Research of a phase change form optical recording medium activates as optical memory in which record of the information by the exposure of a laser beam, playback, and elimination are possible, and a part has come to be put in practical use. These many are using the ingredient of a germanium-Sb-Te system (JP,62-73438,A, JP,63-228433,A). On the other hand, the research which aimed at the transposition with perfect of a compact disk (CD) is also progressing, and the class of current some is proposed. An In-Se system is used as a record layer as the example. SiO2 A dielectric layer, And the thing (collection [of the 4th phase change record study group symposium drafts] P. 82-86) of a configuration of having used Cu for the reflecting layer, Although there is a thing (collection [of the 5th phase change record study group symposium drafts] P. 9-14) of a configuration of having used ZnS-SiO2 for the dielectric layer, and having used Au for the metallic reflective layer etc. using the conventional germanium-Sb-Te system as a record ingredient and all use cross protection The technical problem which has set at the point of a high reflection factor, implementation of high contrast and record sensibility, and an exaggerated light property, and should still be solved is left behind.
[0003]
[Problem(s) to be Solved by the Invention] The purpose of this invention offers a good optical recording medium in a high reflection factor, high contrast, high record sensibility, and all the over-writing properties.
[0004]
[Means for Solving the Problem] This invention is characterized by the average coordination number of the record ingredient being in the range of 2.0-3.0 in the optical recording medium which has the property that are before and after the exposure of light and an optical constant changes. A 0.55 or more contrast optical property and high record sensibility are not only obtained at 60% or more of reflection factors, but according to this optical recording medium, improvement in an elimination property is expectable.
[0005] Below, this invention is explained further at a detail. Then, when the optical recording medium which pointed to the conventional high reflection factor and high contrast is devised now, there are circumstances where the initial state (crystallization condition) has designed by the transposition with perfect of CD at the 0.6 or more contrast target over 70% or more of reflection factor and the reflection factor in an amorphous state. However, in order to record under the reflection factor of 70% or more of initial states so that it may understand from now on, the present condition is needing LD of high power and having the problem in respect of record sensibility. Then, the thing for raising record sensibility with a high reflection factor type optical recording medium is this invention. In this invention, in order to realize it, consideration of choosing the ingredient which has the average coordination number

between 2.0-3.0 as a record ingredient is made.
[0006] In the case of a phase change form optical recording medium, if it records by irradiating a laser beam and making it amorphous on the film in a crystallized state, therefore amorphous-ization is realized easily, this will lead to high sensitivity-ization. Then, if the average coordination number of a record ingredient is between 2.0-3.0, it can expect becoming the inclination which amorphous-ization tends to carry out (the organization potency of glass and the relation of the average coordination number are analyzed by Philips.). J.C.Phillps:J.Non-Cryst.,Sollid.34 153(1979))
[0007] A general formula is expressed with AxB 1-x, and thinking as such an ingredient can consider at least the compound which consists of a kind of element with which a kind of element with which A was chosen from Zn, Ga, In, Si, germanium, Sn, Bi, and Sb, and B were chosen from Se, Te, and S. It is desirable for the average coordination number of these compounds to be between 2.3-2.6 especially. Moreover, it is necessary to determine the value of X which determines the presentation of A and B so that the average coordination number may come between 2.0-3.0. For example, the average coordination number will be set to 3.0 at the time of X= 0.5, and GexSe 1-x will exceed 3 at the time or more of X= 0.5. Therefore, what is necessary is to adjust a presentation to X= 0.5 or less, and just to make it the average coordination number come between 2.3-2.6, if desirably possible as mentioned above. The value of such X is 0.15<=X<=0.30. Thus, amorphous-ization becomes easy and a high reflection factor type ingredient can also expect that record sensibility will improve.
[0008] In this invention, generation and growth of the crystalline nucleus of 1-AxBx ingredient are mainly controllable by adding a kind of element at least as an impurity out of Au, Ag, Cu, Cr, Ti, Co, Mn, Tb, and Sm. Although the reason which can do such a thing is not clear for the moment, it is thought that does an alloying element work as a crystalline nucleus, or it will act as a terminator. In addition, it is required to adjust, as the average coordination number of AxB 1-x of a record ingredient is between 2.0-3.0 also in the addition of an impurity at this time.
[0009] Since the record ingredient concerning this invention points to a high reflection factor and high contrast, in order to realize this, it is desirable to use the multiplex cross protection by the lamination of an optical recording medium. Therefore, what has a certain amount of transparency component to light as a record ingredient is good. concrete -- the band gap of a record ingredient -- 1.0eV or more -- or it is necessary to make light easy to make thickness of a record layer thin, when a band gap is 1.0eV or less, and to penetrate However, in the case of which, it is required for the amplitude damping coefficient at the time of elimination (crystallized state) to take preferably or less for 0.35 0.6 or less. Multiplex interference of an optical recording medium can be well used by the design by this.
[0010] Moreover, at this time, in order to raise multiplex cross protection, a dielectric layer can be prepared in the upper and lower sides of a record layer. As an ingredient used for this dielectric layer, inorganic sulfide, such as inorganic nitrides, such as an inorganic oxide of SiO, SiO2, ZnO, SnO2, aluminum 2O3, TiO2 and In 2O3, and ZrO2 grade, Si3N4, and AlN, TiN, BN, ZrN, and ZnS, etc. can be used. The duty as a multiplex interference layer also achieves the dielectric layer using these ingredients to the duty and coincidence of a heat-resistant protective layer.
[0011] A thing transparent as much as possible is mentioned to one of the important need properties as an interference layer. That is, it is required that the capacity penetrated without absorbing light as much as possible within the given wavelength should be large. Although this capacity is determined by the band gap of an ingredient, it is shown by the amplitude damping coefficient of the imaginary part of complex index of refraction as an optical standard. The ingredient with a large amplitude damping coefficient has large absorption, or its reflection is large in a certain wavelength region. Therefore, it is desirable for the amplitude damping coefficient k to be small as much as possible in the target wavelength region. With [the amplitude damping coefficient k of a dielectric layer] 0.2 [or less], in the record ingredient concerning this invention, cross protection can fully be used in a 350nm - 850nm wavelength region.
[0012] The optical recording medium of this invention can still also have a reflective heat dissipation layer. This has the function which carries out resorption in the work and record layer which are made to reflect the work which controls thermally the laser beam which carries out incidence, and the light

which penetrated the record layer and the dielectric layer, and raise interference. As a reflective heat dissipation layer ingredient, although various metals and an alloy ingredient are usable, aluminum alloys, such as silver alloys, such as Ag-Pd, Ag-Ti, Ag-nickel, Ag-Cr, Ag-Mn, Ag-Au, and Ag-aluminum, aluminum-Ti, aluminum-nickel, aluminum-Mn, aluminum-Cr, aluminum-Zr, and aluminum-Si, are desirable. When especially endurance is considered, an aluminum-Zr-Fe alloy is suitable. As for the presentation ratio to Zr at this time, and aluminum of Fe, it is desirable that it is 2 or less % of the weight in order to prevent decline in the thermal conductivity of the alloy film.

[0013] Next, the concrete configuration of this invention is explained with reference to a drawing. Drawing 1 shows the example of a configuration of this invention, and the lower heatproof protective layer 2, the record layer 3, the up heatproof protective layer 4, and the reflective heat dissipation layer 5 are formed on the substrate 1. Although it is not necessary to necessarily prepare a heat-resistant protective layer in the both sides of a record layer, when a substrate is an ingredient with low thermal resistance like polycarbonate resin, it is desirable to form the lower heatproof protective layer 2 at least.

[0014] The ingredient of a substrate is glass, the ceramics, or resin, and a resin substrate is usually suitable for it in respect of a moldability and cost. As an example of representation of resin, although polycarbonate resin, acrylic resin, an epoxy resin, polystyrene resin, acrylonitrile styrene copolymer resin, polyethylene resin, polypropylene resin, silicone system resin, fluorine form resin, ABS plastics, urethane resin, etc. are raised, polycarbonate resin is desirable in respect of workability, an optical property, etc. Moreover, the configuration of a substrate may have the shape of the shape of a disk, the shape of a card, and a sheet.

[0015] Although an inorganic oxide which was mentioned above, an inorganic nitrogen ghost, and an inorganic sulfur ghost can be used as a heat-resistant protective layer, carbide, and diamond-like carbon or those mixture, such as SiC, TaC, WC, TiC, and ZrC, can also be used. these layers -- vacuum evaporation technique, a spatter, a plasma-CVD method, a CVD method, and ion play DINGU -- it is formed by law, an electron beam method, etc. Although the thickness of these layers changes also with the function, i.e., a heat-resistant protective layer, and multiplex interference layers, when it thinks as a heat-resistant protective layer, it is good to consider [200-5000A] as 500-3000A suitably. If the function as a heat-resistant protective layer is lost and it becomes thicker than 5000A, a fall and interfacial peeling of sensibility will become easy to arise in the case of 200A or less.

[0016] A metal and an alloy ingredient which were mentioned above can be used as a reflective heat dissipation layer. these layers -- vacuum evaporation technique, the sputtering method, a plasma-CVD method, and ion play DINGU -- it is formed by law, an electron beam method, etc. 200-3000A 500-2000A of thickness is suitably good.

[0017] moreover, the record layer in this invention -- various vapor growth, for example, vacuum evaporation technique, the sputtering method, a plasma-CVD method, and ion play DINGU -- it can form with law, electron beam vacuum deposition, etc. Although the amplitude damping coefficient in an initial state (crystallization condition) changes also with ingredients from the need of carrying out to 0.6 or less, 200A - 2000A 300A - 1000A of a band gap is [a thing 1.0eV or more] preferably good, in order that the thickness of a record layer may realize a high reflection factor and high contrast. 50A - 500A 100A - 250A of a band gap is [a thing 1.0eV or less] preferably good. That is, since absorption becomes large when a band gap is 1.0eV or less, it is necessary to make thickness thin and to increase the transmitted light.

[0018]

[Example] Hereafter, an example explains this invention still more concretely.

[0019] The laminating of a lower heatproof protective layer, a record layer, an up heatproof protective layer, and the reflective heat dissipation layer was carried out by the spatter one by one by the configuration shown in Table 1 on the polycarbonate substrate with 1.2mm [in an example 1 pitch 1.6micrometer and a slot and thickness with a depth of 700A], and a diameter [phi] of 120mm. In order to measure a record layer independent optical constant at this time, the 50x50x1mm glass substrate was set. Moreover, what measured the optical constant of a record layer at the thing of the amorphous condition after a spatter and 250 degrees C, and measured the thing of the crystal condition after

annealing by the ellipsometer (lambda= 633nm) is shown in Table 2. Moreover, the average coordination number and the simulation value of the optical property under the layer B configuration in Table 1 are also shown.

[0020]

[Table 1]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	800	rf・スパッタ
記録層	$Bi_{89.75}Se_{59.75}Co_{0.75}$	400	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[Table 2]

物性 / 材料	屈折率		振幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$Bi_{89.75}Se_{59.75}Co_{0.75}$	5.235	5.193	3.568	0.374	約2.4	70.3	0.63

[0021] Next, the disk property was evaluated. First, after initializing the obtained disk (crystallization) and recording with the wavelength of 830nm, linear velocity 1.3 m/s, the frequency of 200kHz, and 50% duty ratio, the exaggerated light was performed with the frequency of 720kHz, and 50% duty ratio. At this time, C/N and the elimination ratio of a signal with a frequency of 720kHz were measured. A result is shown in Table 3. However, Pw:record power, Pe: It is elimination power.

[0022]

[Table 3]

Pw／Pe (mW)		23／9	25／9	27／9	29／9
特性	C／N (dB)	49	51	52	53
	消去比 (−dB)	24	25	25	25

Moreover, the reflection factor (groove) was 62% and contrast was 0.58. It turns out that the optical recording medium which has a reflection factor with the optical recording medium of this invention more expensive than this and high contrast can be offered.

[0023] The disk of a configuration of that a spatter shows to Table 4 was produced by the same approach as example 2 example 1. And the value which measured the record layer independent optical constant at this time is shown in Table 5, and a disk property is shown in Table 6. Disk conditions are

the same as an example 1.
[Table 4]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	1100	rf・スパッタ
記録層	$Ge_{0.35}Se_{0.60}Ag_{0.05}$	400	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0024]
[Table 5]

物性 / 材料	屈折率		振幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$Ge_{0.35}Se_{0.60}Ag_{0.05}$	5.392	5.692	1.561	0.321	約2.7	74	0.57

[0025]
[Table 6]

Pw／Pe (mW)		23／10	25／10	27／10	29／10
特性	C／N (dB)	43	45	48	50
	消去比 (−dB)	23	23	24	24

[0026] The reflection factor of this disk was 66%, and contrast was 0.53. The optical recording medium of this this invention as well as an example 1 is known by that they are a high reflection factor and high contrast.
[0027] The disk of a configuration of that a spatter shows to Table 7 was produced by the same approach as example 3 examples 1 and 2. And Table 8 and a disk property are shown for the value which measured the optical constant record layer independent [at this time] in Table 9.
[Table 7]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	2200	rf・スパッタ
記録層	$In_{0.45}Te_{0.50}Tb_{0.05}$	140	rf・スパッタ
上部耐熱保護層	AlN	700	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0028]
[Table 8]

物性 / 材料	屈折率		振幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$In_{0.46}Te_{0.50}Tb_{0.05}$	3.877	3.368	0.861	0.479	約2.40	66	0.69

[0029]
[Table 9]

Pw／Pe (mW)		23／9	25／9	27／9	29／9
特性	C／N (dB)	48	50	52	52
	消去比 (−dB)	25	25	26	26

[0030] The reflection factor of this disk is 61%, contrast is 0.54, and it can expect as a high reflection factor disk.
[0031] The disk of a configuration of that a spatter shows to Table 10 was produced by the same approach as example 4 examples 1, 2, and 3. And the record layer independent optical constant was measured. The value is shown in Table 11. Moreover, the disk property in the exaggerated write mode at this time is shown in Table 12.
[0032]
[Table 10]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	1300	rf・スパッタ
記録層	$Ga_{0.5}Se_{0.45}Cu_{0.05}$	620	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0033]
[Table 11]

物性 / 材料	屈折率		振幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$Ga_{0.5}Se_{0.45}Cu_{0.05}$	4.014	6.059	1.629	0.522	約2.4	58	0.52

[0034]
[Table 12]

Pw/Pe (mW)		23/11	25/11	27/11	29/11
特性	C/N (dB)	40	45	47	47
	消去比 (−dB)	20	23	23	23

[0035] It is thought that the reflection factor of this disk is 55%, contrast is 0.50, and the optical recording medium of this invention of an example is also usable as a high reflection factor and an optical recording medium for high contrast, and it is ******.
[0036] Examples 1-4 showed that the phase change form record ingredient of this invention was fully usable also from the point of record sensibility as an optical recording medium corresponding to a high reflection factor and high contrast. Moreover, also in repetition use, degradation is not accepted by 3x103 times, but it is thought that this is based on the effectiveness which used the aluminum-Zn-Fe alloy for the reflective heat dissipation layer.
[0037]
[Effect of the Invention] According to the optical recording medium according to claim 1, by using the record ingredient which has the average coordination number in 2.0-3.0, it becomes possible to make easy amorphous-ization at the time of record, and improvement in record sensibility can be aimed at. According to the optical recording medium according to claim 2, it becomes possible to have high reflection, high contrast, and high record sensibility. According to the optical recording medium according to claim 3, by adding an impurity, it is possible to control the crystallization rate of a record ingredient, and an elimination property can be raised. According to the optical recording medium according to claim 4, when the amplitude damping coefficient at the time of the crystal of a record

ingredient carries out to 0.6 (0.35 or less are preferably good) or less, the multiplex cross protection by the lamination of an optical recording medium can be used, and a high reflection factor and high contrast are attained. According to the optical recording medium according to claim 5, the improvement in a repetition property, a raise in the reflection factor of the record medium by multiplex cross protection, and high contrast-ization are expectable by having a heat-resistant protective layer. According to the optical recording medium according to claim 6, improvement in the repetition property by a deployment of incident light and accumulation prevention of heat is expectable by preparing a reflective heat dissipation layer.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to the optical recording medium according to claim 1, by using the record ingredient which has the average coordination number in 2.0-3.0, it becomes possible to make easy amorphous-ization at the time of record, and improvement in record sensibility can be aimed at. According to the optical recording medium according to claim 2, it becomes possible to have high reflection, high contrast, and high record sensibility. According to the optical recording medium according to claim 3, by adding an impurity, it is possible to control the crystallization rate of a record ingredient, and an elimination property can be raised. According to the optical recording medium according to claim 4, when the amplitude damping coefficient at the time of the crystal of a record ingredient carries out to 0.6 (0.35 or less are preferably good) or less, the multiplex cross protection by the lamination of an optical recording medium can be used, and a high reflection factor and high contrast are attained. According to the optical recording medium according to claim 5, the improvement in a repetition property, a raise in the reflection factor of the record medium by multiplex cross protection, and high contrast-ization are expectable by having a heat-resistant protective layer. According to the optical recording medium according to claim 6, improvement in the repetition property by a deployment of incident light and accumulation prevention of heat is expectable by preparing a reflective heat dissipation layer.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The purpose of this invention offers a good optical recording medium in a high reflection factor, high contrast, high record sensibility, and all the over-writing properties.

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MEANS

[Means for Solving the Problem] This invention is characterized by the average coordination number of the record ingredient being in the range of 2.0-3.0 in the optical recording medium which has the property that are before and after the exposure of light and an optical constant changes. A 0.55 or more contrast optical property and high record sensibility are not only obtained at 60% or more of reflection factors, but according to this optical recording medium, improvement in an elimination property is expectable.
[0005] Below, this invention is explained further at a detail. Then, when the optical recording medium which pointed to the conventional high reflection factor and high contrast is devised now, there are circumstances where the initial state (crystallization condition) has designed by the transposition with perfect of CD at the 0.6 or more contrast target over 70% or more of reflection factor and the reflection factor in an amorphous state. However, in order to record under the reflection factor of 70% or more of initial states so that it may understand from now on, the present condition is needing LD of high power and having the problem in respect of record sensibility. Then, the thing for raising record sensibility with a high reflection factor type optical recording medium is this invention. In this invention, in order to realize it, consideration of choosing the ingredient which has the average coordination number between 2.0-3.0 as a record ingredient is made.
[0006] In the case of a phase change form optical recording medium, if it records by irradiating a laser beam and making it amorphous on the film in a crystallized state, therefore amorphous-ization is realized easily, this will lead to high sensitivity-ization. Then, if the average coordination number of a record ingredient is between 2.0-3.0, it can expect becoming the inclination which amorphous-ization tends to carry out (the organization potency of glass and the relation of the average coordination number are analyzed by Philips.). J.C.Phillps:J.Non-Cryst.,Sollid.34 153(1979))
[0007] A general formula is expressed with AxB 1-x, and thinking as such an ingredient can consider at least the compound which consists of a kind of element with which a kind of element with which A was chosen from Zn, Ga, In, Si, germanium, Sn, Bi, and Sb, and B were chosen from Se, Te, and S. It is desirable for the average coordination number of these compounds to be between 2.3-2.6 especially. Moreover, it is necessary to determine the value of X which determines the presentation of A and B so that the average coordination number may come between 2.0-3.0. For example, the average coordination number will be set to 3.0 at the time of X= 0.5, and GexSe 1-x will exceed 3 at the time or more of X= 0.5. Therefore, what is necessary is to adjust a presentation to X= 0.5 or less, and just to make it the average coordination number come between 2.3-2.6, if desirably possible as mentioned above. The value of such X is 0.15<=X<=0.30. Thus, amorphous-ization becomes easy and a high reflection factor type ingredient can also expect that record sensibility will improve.
[0008] In this invention, generation and growth of the crystalline nucleus of 1-AxBx ingredient are mainly controllable by adding a kind of element at least as an impurity out of Au, Ag, Cu, Cr, Ti, Co, Mn, Tb, and Sm. Although the reason which can do such a thing is not clear for the moment, it is thought that does an alloying element work as a crystalline nucleus, or it will act as a terminator. In addition, it is required to adjust, as the average coordination number of AxB 1-x of a record ingredient is

between 2.0-3.0 also in the addition of an impurity at this time.
[0009] Since the record ingredient concerning this invention points to a high reflection factor and high contrast, in order to realize this, it is desirable to use the multiplex cross protection by the lamination of an optical recording medium. Therefore, what has a certain amount of transparency component to light as a record ingredient is good. concrete -- the band gap of a record ingredient -- 1.0eV or more -- or it is necessary to make light easy to make thickness of a record layer thin, when a band gap is 1.0eV or less, and to penetrate However, in the case of which, it is required for the amplitude damping coefficient at the time of elimination (crystallized state) to take preferably or less for 0.35 0.6 or less. Multiplex interference of an optical recording medium can be well used by the design by this.
[0010] Moreover, at this time, in order to raise multiplex cross protection, a dielectric layer can be prepared in the upper and lower sides of a record layer. As an ingredient used for this dielectric layer, inorganic sulfide, such as inorganic nitrides, such as an inorganic oxide of SiO, SiO2, ZnO, SnO2, aluminum 2O3, TiO2 and In 2O3, and ZrO2 grade, Si3N4, and AlN, TiN, BN, ZrN, and ZnS, etc. can be used. The duty as a multiplex interference layer also achieves the dielectric layer using these ingredients to the duty and coincidence of a heat-resistant protective layer.
[0011] A thing transparent as much as possible is mentioned to one of the important need properties as an interference layer. That is, it is required that the capacity penetrated without absorbing light as much as possible within the given wavelength should be large. Although this capacity is determined by the band gap of an ingredient, it is shown by the amplitude damping coefficient of the imaginary part of complex index of refraction as an optical standard. The ingredient with a large amplitude damping coefficient has large absorption, or its reflection is large in a certain wavelength region. Therefore, it is desirable for the amplitude damping coefficient k to be small as much as possible in the target wavelength region. With [the amplitude damping coefficient k of a dielectric layer] 0.2 [or less], in the record ingredient concerning this invention, cross protection can fully be used in a 350nm - 850nm wavelength region.
[0012] The optical recording medium of this invention can still also have a reflective heat dissipation layer. This has the function which carries out resorption in the work and record layer which are made to reflect the work which controls thermally the laser beam which carries out incidence, and the light which penetrated the record layer and the dielectric layer, and raise interference. As a reflective heat dissipation layer ingredient, although various metals and an alloy ingredient are usable, aluminum alloys, such as silver alloys, such as Ag-Pd, Ag-Ti, Ag-nickel, Ag-Cr, Ag-Mn, Ag-Au, and Ag-aluminum, aluminum-Ti, aluminum-nickel, aluminum-Mn, aluminum-Cr, aluminum-Zr, and aluminum-Si, are desirable. When especially endurance is considered, an aluminum-Zr-Fe alloy is suitable. As for the presentation ratio to Zr at this time, and aluminum of Fe, it is desirable that it is 2 or less % of the weight in order to prevent decline in the thermal conductivity of the alloy film.
[0013] Next, the concrete configuration of this invention is explained with reference to a drawing. Drawing 1 shows the example of a configuration of this invention, and the lower heatproof protective layer 2, the record layer 3, the up heatproof protective layer 4, and the reflective heat dissipation layer 5 are formed on the substrate 1. Although it is not necessary to necessarily prepare a heat-resistant protective layer in the both sides of a record layer, when a substrate is an ingredient with low thermal resistance like polycarbonate resin, it is desirable to form the lower heatproof protective layer 2 at least.
[0014] The ingredient of a substrate is glass, the ceramics, or resin, and a resin substrate is usually suitable for it in respect of a moldability and cost. As an example of representation of resin, although polycarbonate resin, acrylic resin, an epoxy resin, polystyrene resin, acrylonitrile styrene copolymer resin, polyethylene resin, polypropylene resin, silicone system resin, fluorine form resin, ABS plastics, urethane resin, etc. are raised, polycarbonate resin is desirable in respect of workability, an optical property, etc. Moreover, the configuration of a substrate may have the shape of the shape of a disk, the shape of a card, and a sheet.
[0015] Although an inorganic oxide which was mentioned above, an inorganic nitrogen ghost, and an inorganic sulfur ghost can be used as a heat-resistant protective layer, carbide, and diamond-like carbon or those mixture, such as SiC, TaC, WC, TiC, and ZrC, can also be used. these layers -- vacuum

evaporation technique, a spatter, a plasma-CVD method, a CVD method, and ion play DINGU -- it is formed by law, an electron beam method, etc. Although the thickness of these layers changes also with the function, i.e., a heat-resistant protective layer, and multiplex interference layers, when it thinks as a heat-resistant protective layer, it is good to consider [200-5000A] as 500-3000A suitably. If the function as a heat-resistant protective layer is lost and it becomes thicker than 5000A, a fall and interfacial peeling of sensibility will become easy to arise in the case of 200A or less.

[0016] A metal and an alloy ingredient which were mentioned above can be used as a reflective heat dissipation layer. these layers -- vacuum evaporation technique, the sputtering method, a plasma-CVD method, and ion play DINGU -- it is formed by law, an electron beam method, etc. 200-3000A 500-2000A of thickness is suitably good.

[0017] moreover, the record layer in this invention -- various vapor growth, for example, vacuum evaporation technique, the sputtering method, a plasma-CVD method, and ion play DINGU -- it can form with law, electron beam vacuum deposition, etc. Although the amplitude damping coefficient in an initial state (crystallization condition) changes also with ingredients from the need of carrying out to 0.6 or less, 200A - 2000A 300A - 1000A of a band gap is [a thing 1.0eV or more] preferably good, in order that the thickness of a record layer may realize a high reflection factor and high contrast. 50A - 500A 100A - 250A of a band gap is [a thing 1.0eV or less] preferably good. That is, since absorption becomes large when a band gap is 1.0eV or less, it is necessary to make thickness thin and to increase the transmitted light.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing having shown the typical lamination of the optical recording medium of this invention.
[Description of Notations]
1 Substrate
2 Lower Heatproof Protective Layer
3 Record Layer
4 Up Heatproof Protective Layer
5 Reflective Heat Dissipation Layer

[Translation done.]

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EXAMPLE

[Example] Hereafter, an example explains this invention still more concretely.
[0019] The laminating of a lower heatproof protective layer, a record layer, an up heatproof protective layer, and the reflective heat dissipation layer was carried out by the spatter one by one by the configuration shown in Table 1 on the polycarbonate substrate with 1.2mm [in an example 1 pitch 1.6micrometer and a slot and thickness with a depth of 700A], and a diameter [phi] of 120mm. In order to measure a record layer independent optical constant at this time, the 50x50x1mm glass substrate was set. Moreover, what measured the optical constant of a record layer at the thing of the amorphous condition after a spatter and 250 degrees C, and measured the thing of the crystal condition after annealing by the ellipsometer (lambda= 633nm) is shown in Table 2. Moreover, the average coordination number and the simulation value of the optical property under the layer B configuration in Table 1 are also shown.
[0020]
[Table 1]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	800	rf・スパッタ
記録層	$Bi_{39.75}Se_{59.75}Co_{0.75}$	400	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[Table 2]

物性 / 材料	屈折率		損幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$Bi_{39.75}Se_{59.75}Co_{0.75}$	5.235	5.193	3.568	0.374	約2.4	70.3	0.69

[0021] Next, the disk property was evaluated. First, after initializing the obtained disk (crystallization)

and recording with the wavelength of 830nm, linear velocity 1.3 m/s, the frequency of 200kHz, and 50% duty ratio, the exaggerated light was performed with the frequency of 720kHz, and 50% duty ratio. At this time, C/N and the elimination ratio of a signal with a frequency of 720kHz were measured. A result is shown in Table 3. However, Pw:record power, Pe: It is elimination power.

[0022]

[Table 3]

Pw／Pe (mW)		23／9	25／9	27／9	29／9
特性	C／N (dB)	49	51	52	53
	消去比 (－dB)	24	25	25	25

Moreover, the reflection factor (groove) was 62% and contrast was 0.58. It turns out that the optical recording medium which has a reflection factor with the optical recording medium of this invention more expensive than this and high contrast can be offered.

[0023] The disk of a configuration of that a spatter shows to Table 4 was produced by the same approach as example 2 example 1. And the value which measured the record layer independent optical constant at this time is shown in Table 5, and a disk property is shown in Table 6. Disk conditions are the same as an example 1.

[Table 4]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	1100	rf・スパッタ
記録層	$Ge_{0.35}Se_{0.60}Ag_{0.05}$	400	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0024]

[Table 5]

物性 ＼ 材料	屈折率		振幅減衰係数		平均配位数	シュミレーション値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$Ge_{0.35}Se_{0.60}Ag_{0.05}$	5.392	5.692	1.561	0.321	約2.7	74	0.67

[0025]

[Table 6]

Pw／Pe (mW)		23／10	25／10	27／10	29／10
特	C／N (dB)	43	45	48	50
性	消去比 (－dB)	23	23	24	24

[0026] The reflection factor of this disk was 66%, and contrast was 0.53. The optical recording medium of this this invention as well as an example 1 is known by that they are a high reflection factor and high contrast.

[0027] The disk of a configuration of that a spatter shows to Table 7 was produced by the same approach as example 3 examples 1 and 2. And Table 8 and a disk property are shown for the value which measured the optical constant record layer independent [at this time] in Table 9.

[Table 7]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	2200	rf・スパッタ
記録層	$In_{0.45}Te_{0.50}Tb_{0.05}$	140	rf・スパッタ
上部耐熱保護層	AlN	700	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0028]

[Table 8]

物性 ＼ 材料	屈折率		反射減衰係数		平均配位数	ジッター値	
	アモルファス	クリスタル	アモルファス	クリスタル		結晶時反射率(%)	コントラスト
$In_{0.46}Te_{0.50}Tb_{0.05}$	3.877	3.368	0.861	0.479	約2.40	65	0.59

[0029]

[Table 9]

Pw／Pe (mW)		23／9	25／9	27／9	29／9
特	C／N (dB)	48	50	52	52
性	消去比 (－dB)	25	25	26	26

[0030] The reflection factor of this disk is 61%, contrast is 0.54, and it can expect as a high reflection factor disk.
[0031] The disk of a configuration of that a spatter shows to Table 10 was produced by the same approach as example 4 examples 1, 2, and 3. And the record layer independent optical constant was measured. The value is shown in Table 11. Moreover, the disk property in the exaggerated write mode at this time is shown in Table 12.
[0032]
[Table 10]

層構成	成膜条件		
	材料	膜厚(Å)	製法
下部耐熱保護層	$ZnS \cdot SiO_2$	1300	rf・スパッタ
記録層	$Ga_{0.5}Se_{0.45}Cu_{0.05}$	620	rf・スパッタ
上部耐熱保護層	AlN	300	rf・スパッタ
反射放熱層	$Al_{98}Zr_{1.5}Fe_{0.5}$	700	rf・スパッタ

[0033]
[Table 11]

物性 / 材料	屈折率		消衰係数		平均配位数	シュミレーション値	
	アモルファス	メタスタル	アモルファス	メタスタル		結晶時反射率(%)	コントラスト
$Ga_{0.5}Se_{0.45}Cu_{0.05}$	4.014	5.059	1.629	0.522	約2.4	58	0.52

[0034]
[Table 12]

Pw/Pe (mW)		23/11	25/11	27/11	29/11
特性	C/N (dB)	40	45	47	47
	消去比 (−dB)	20	23	23	23

[0035] It is thought that the reflection factor of this disk is 55%, contrast is 0.50, and the optical recording medium of this invention of an example is also usable as a high reflection factor and an optical recording medium for high contrast, and it is ******.
[0036] Examples 1-4 showed that the phase change form record ingredient of this invention was fully usable also from the point of record sensibility as an optical recording medium corresponding to a high reflection factor and high contrast. Moreover, also in repetition use, degradation is not accepted by 3x103 times, but it is thought that this is based on the effectiveness which used the aluminum-Zn-Fe alloy for the reflective heat dissipation layer.

[Translation done.]

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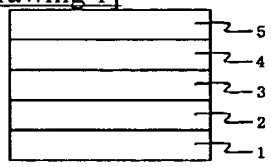
DRAWINGS

[Drawing 1]



1．基板
2．下部耐熱保護層
3．記録層
4．上部耐熱保護層
5．反射放熱層

[Translation done.]